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# Deep Dive: Cluster API

SIG Cluster Lifecycle

# Who are we?



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**Jason DeTiberus**

Senior Member of Technical Staff @VMware  
@detiber



**Hardik Dodiya**

Software Developer @SAP  
@hardikdr

# Agenda



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- Motivation
- What is Cluster API?
- Bootstrapping
- Getting Involved



## Cluster Management: User-stories Evolve

- Manage multiple Kubernetes Clusters in a declarative and centralized way
- Across cloud and on-prem providers
- Scalable, on-demand and self-healing in nature
- kubeadm solves only a subset of the problem

## Ecosystem is fragmented

- Many tools with limited use-cases and varying UX

## Difficult to build higher order functionality

- Additional automation (autoscaling, repair, etc.)
- Managed Kubernetes Services
- Installation and Operational Lifecycle Management

# What is Cluster API?



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Subproject of Kubernetes SIG Cluster Lifecycle

The Cluster API is an effort to bring declarative, Kubernetes-style APIs to cluster creation, configuration, and management.



# What is Cluster API?



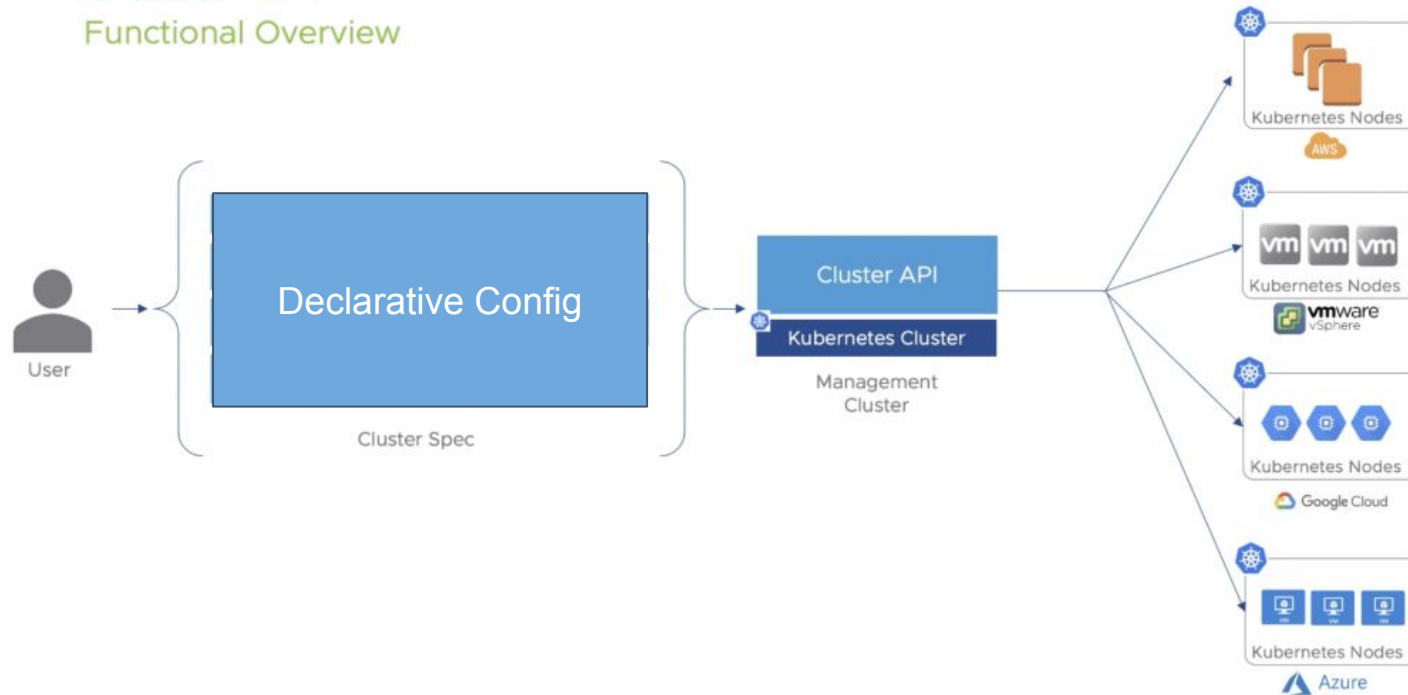
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## Cluster API Functional Overview



# What is Cluster API?



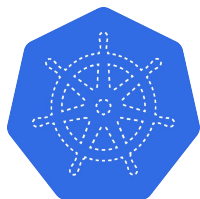
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Cluster



Machine



MachineSet



MachineDeployment



MachineClass



# What is Cluster API?



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Cluster



Machine



MachineSet



MachineDeployment



MachineClass



Pod



ReplicaSet



Deployment



StorageClass





Cluster-wide configuration.

Generic networking concepts:

- Pod and service ranges
- DNS domain
- Cluster endpoint

Providers can modify and override behavior where needed



```
apiVersion: "cluster-api.k8s.io/v1alpha1"
kind: Cluster
metadata:
  name: my-first-cluster
spec:
  providerSpec:
    ...
  clusterNetwork:
    services:
      cidrBlocks: ["10.96.0.0/12"]
    pods:
      cidrBlocks: ["192.168.0.0/16"]
    serviceDomain: "cluster.local"
```

# Machine



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Configuration for a specific machine.

Spec has the desired kubelet version.

Providers can modify and override behavior where needed



```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: Machine
metadata:
  name: my-first-machine
spec:
  providerSpec:
    ...
  versions:
    kubelet: 1.12.0
```

# MachineSet



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Configuration for a group of replica machines

A template for creating machines

Desired number of replicas



```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: MachineSet
metadata:
  name: my-first-machine-set
spec:
  replicas: 3
  template:
    metadata:
    spec:
      ...
```

# MachineDeployment



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Declarative updates for Machines  
via MachineSets

Update strategy allows control of  
the rate at which a change is  
applied



```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: MachineDeployment
metadata:
  name: my-first-machine-deployment
spec:
  replicas: 3
  template:
    ...
  strategy:
    type: RollingUpdate
    rollingUpdate:
      maxUnavailable: 0
      maxSurge: 1
```

# Provider Spec



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Platform-specific configuration  
for Machines and Clusters

Defined by providers

The embedded type is expected  
to itself be a versioned  
Kubernetes-style type



```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: Machine
metadata:
  name: my-first-machine
spec:
  providerSpec:
    value:
      apiVersion: "gceproviderconfig/v1alpha1"
      kind: "GCEMachineProviderConfig"
      project: "gke-kubecon"
      zone: "us-central1-f"
      machineType: "n1-standard-2"
      os: "ubuntu-1604-lts"
```

# MachineClass



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Platform-specific configuration  
for Machines.

The embedded type is expected  
to itself be a versioned  
Kubernetes-style type.



```
apiVersion: "cluster-api.k8s.io/v1alpha1"
kind: MachineClass
metadata:
  name: my-first-machine-class
spec:
  providerSpec:
    apiversion: "gceproviderconfig/v1alpha1"
    kind: "GCEMachineProviderConfig"
    project: "gke-kubecon"
    zone: "us-central1-f"
    machineType: "n1-standard-2"
    os: "ubuntu-1604-lts"
```



# What is Cluster API?

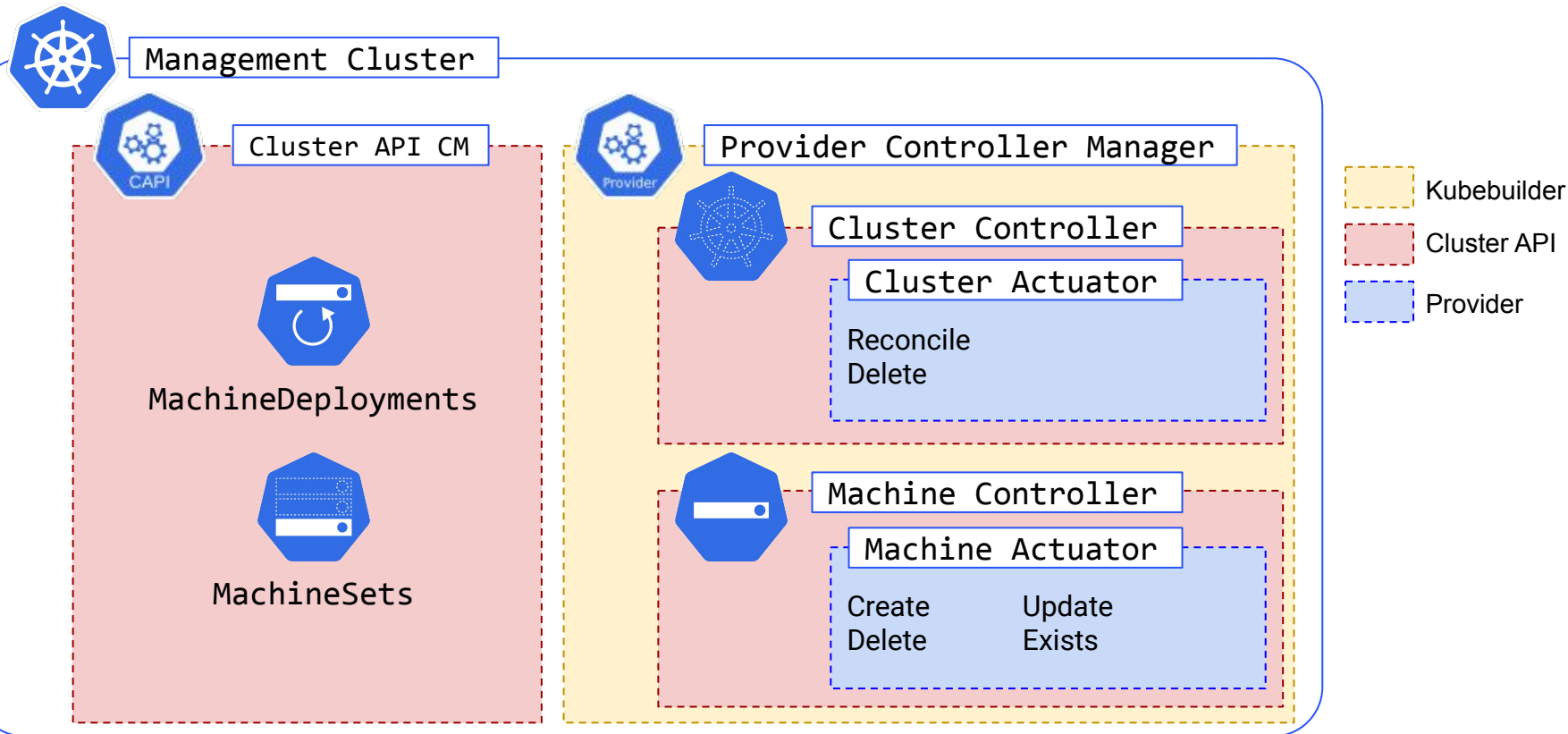


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# Bootstrapping Cluster API

# Bootstrapping

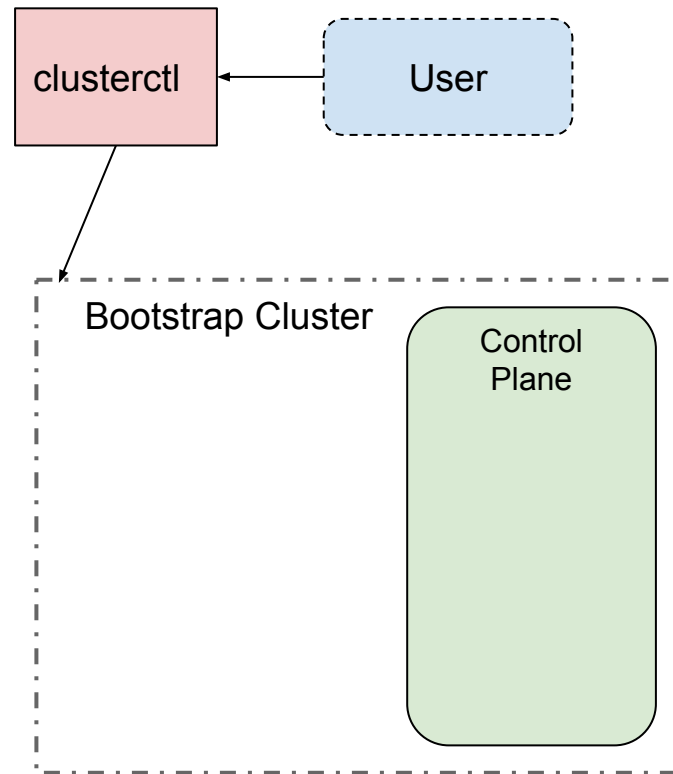


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# Bootstrapping

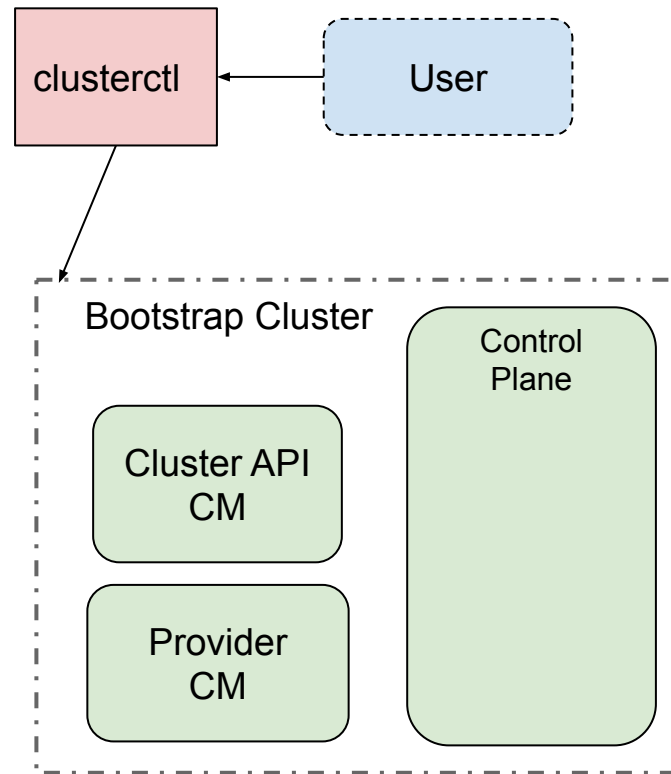


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# Bootstrapping

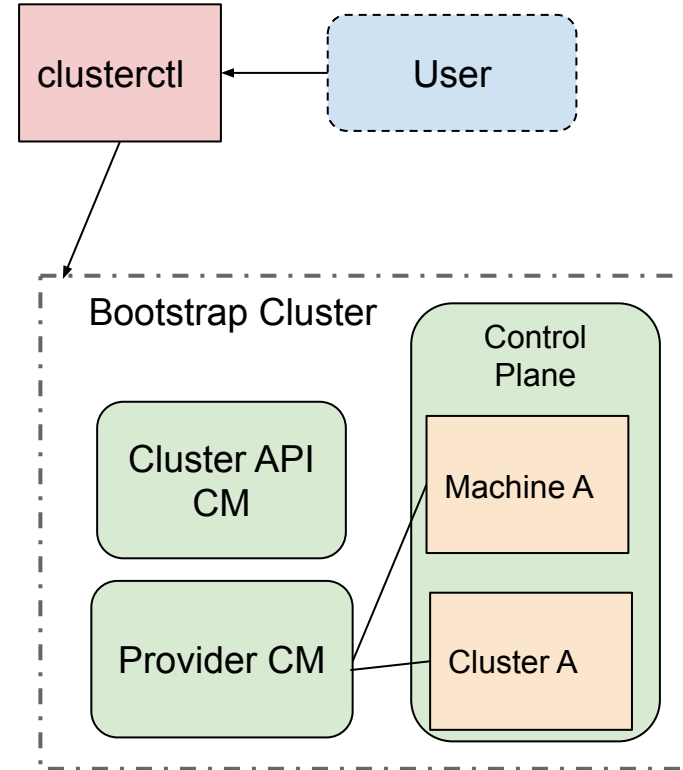


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# Bootstrapping

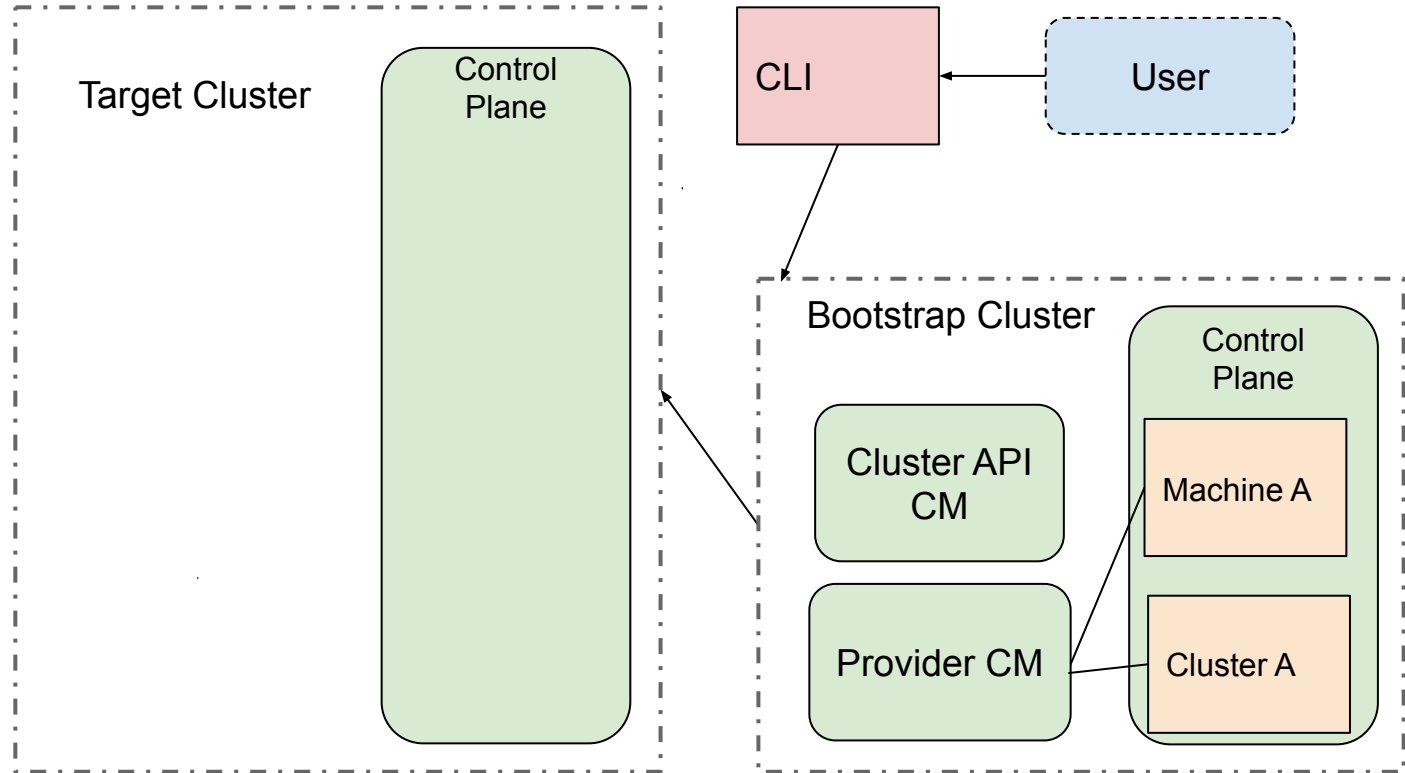


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# Pivoting

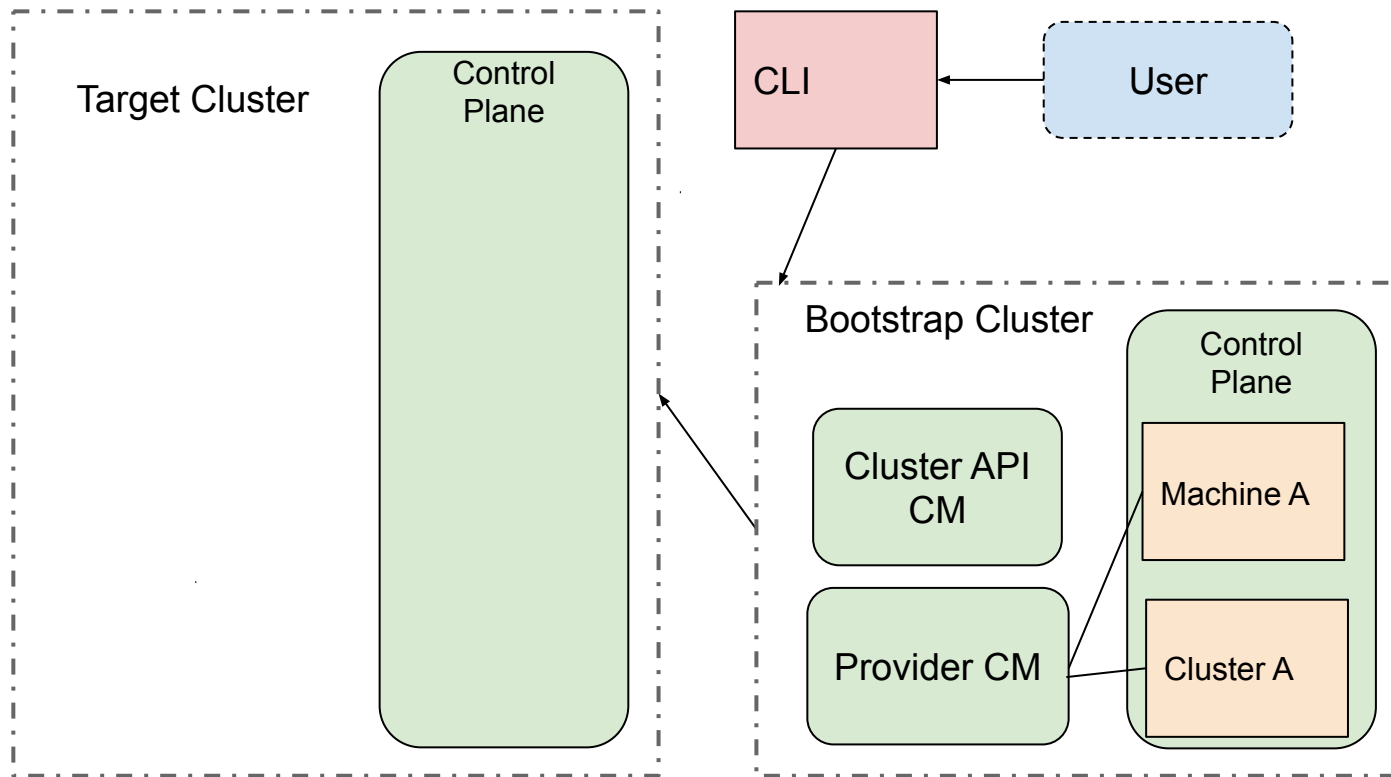


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# Pivoting

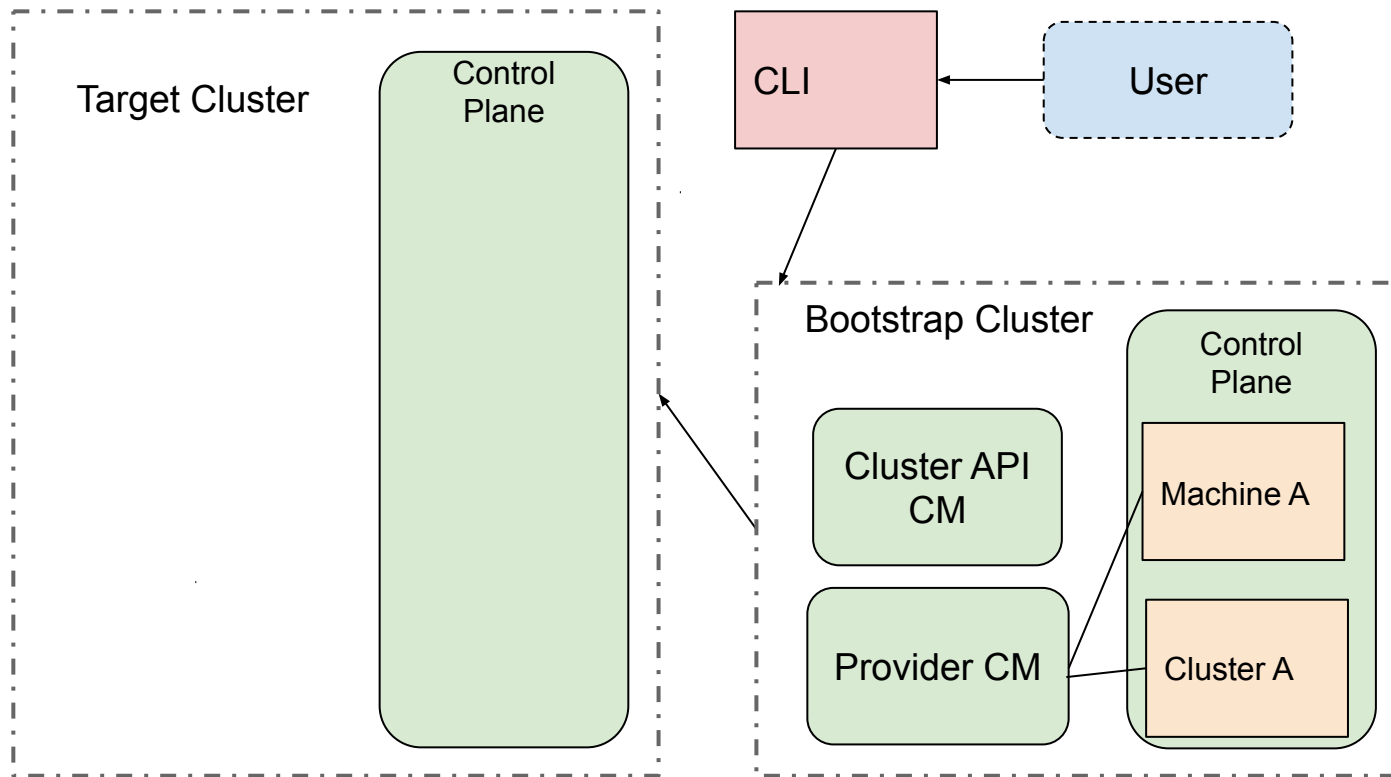


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# Pivoting

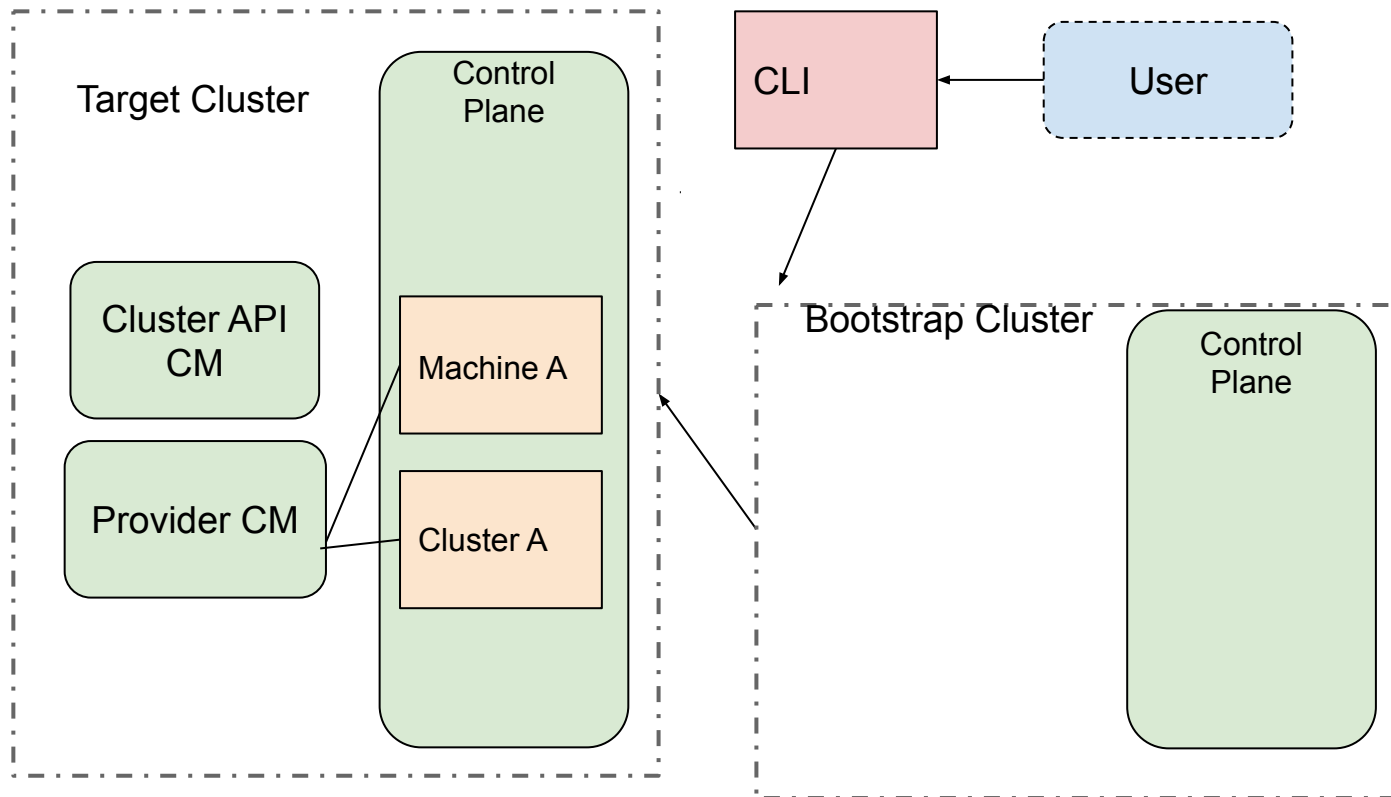


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# Pivoting: Delete Bootstrap Cluster

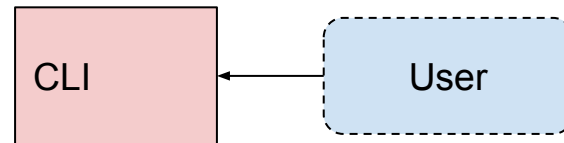
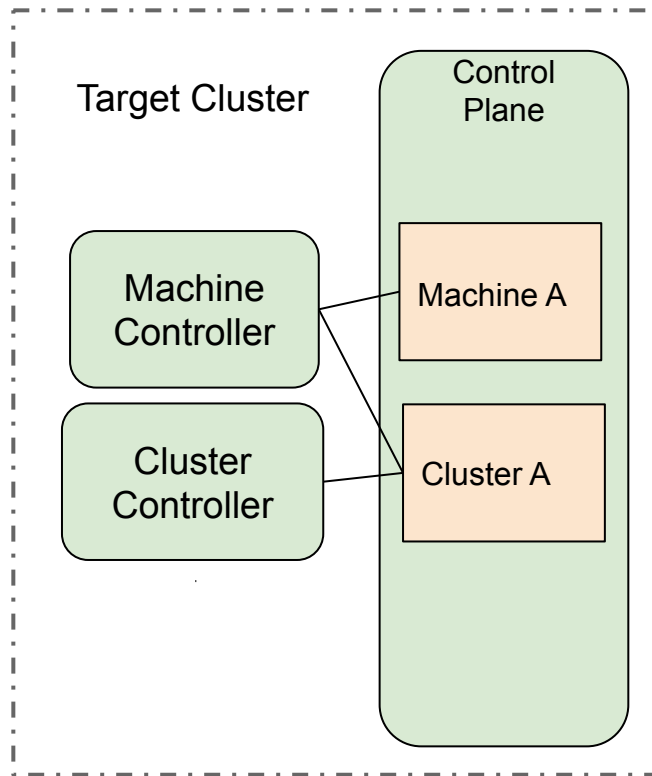


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# Getting Involved



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- Help with documentation / project management
  - No coding skills necessary!
- Look for issues with "help wanted" or "good first issue"
  - Start with small changes, work your way up to larger changes
- Contribute to the provider for your environment
  - Or create one if it doesn't exist

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- <https://github.com/kubernetes-sigs/cluster-api>
- Join kubernetes-sig-cluster-lifecycle
- Weekly meeting on Wed @ 10:00 PT
  - [Meeting Notes](#)
- Slack: #cluster-api



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## Provider Implementations

The code in this repository is independent of any specific deployment environment. Provider specific code is being developed in separate repositories, some of which are also sponsored by SIG-cluster-lifecycle:

- AWS, <https://github.com/kubernetes-sigs/cluster-api-provider-aws>
- Azure, <https://github.com/kubernetes-sigs/cluster-api-provider-azure>
- Baidu Cloud, <https://github.com/baidu/cluster-api-provider-baiducloud>
- Bare Metal, <https://github.com/metal3-io/cluster-api-provider-baremetal>
- DigitalOcean, <https://github.com/kubernetes-sigs/cluster-api-provider-digitalocean>
- Exoscale, <https://github.com/exoscale/cluster-api-provider-exoscale>
- GCE, <https://github.com/kubernetes-sigs/cluster-api-provider-gcp>
- IBM Cloud, <https://github.com/kubernetes-sigs/cluster-api-provider-ibmcloud>
- OpenStack, <https://github.com/kubernetes-sigs/cluster-api-provider-openstack>
- Talos, <https://github.com/talos-systems/cluster-api-provider-talos>
- Tencent Cloud, <https://github.com/TencentCloud/cluster-api-provider-tencent>
- vSphere, <https://github.com/kubernetes-sigs/cluster-api-provider-vsphere>

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## API Adoption

Following are the implementations managed by third-parties adopting the standard cluster-api and/or machine-api being developed here.

- Kubermatic machine-controller, <https://github.com/kubermatic/machine-controller/tree/master>
- Machine API Operator, <https://github.com/openshift/machine-api-operator/tree/master>
- Machine-controller-manager, <https://github.com/gardener/machine-controller-manager/tree/cluster-api>



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# Questions?



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**Thank You!**